REMARKS

Claims 1, 20, and 24 have been amended. Claims 38-58 are canceled without prejudice to the underlying subject matter. Claims 1-37 are currently pending in this application.

The disclosure is objected to because there is a word missing on page 4, paragraph [0013], line 3. The specification has been amended to correct this informality. Therefore, withdrawal of this objection is respectfully requested.

Claims 1-23 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Koizumi et al, US Patent No. 6,661,459 (Koizumi) in view of Kimata, US Patent No. 4,760,273 (Kimata). This rejection is respectfully traversed.

Neither Koizumi nor Kimata, even when considered in combination, teach or suggest all limitations of any of amended independent claims 1 and 20. Specifically, Kozumi and Kimata fail to teach or suggest "a gate of a transistor formed at least partially below a surface of the substrate . . . a channel region of the transistor located below the bottom surface of the gate," as recited by amended independent claim 1. Further, the references fail to teach or suggest "a channel region of the transistor formed below the trench," as recited by amended independent claim 20.

Koizumi relates to a solid state image pickup device capable of efficiently transferring the charge accumulated in a photoelectric conversion element. Koizumi at col. 2, lines 60-63. For this, Koizumi teaches a bypass region of a same conductivity type as the charge accumulation layer between the photodiode and a transfer transistor. Koizumi at col. 4, lines 16-30. As noted by the Examiner, Kozumi does not teach or suggest a gate of a transistor formed at least partially below the surface of the substrate.

Kimata relates to a solid-state image sensor with a charge sweep device (CSD) using Schottky barrier photo sensors. Kimata at col. 1, lines 7-10. Kimata teaches a

vertical CSD that includes a transistor gate buried within a groove. A channel of the CSD is located along a sidewall of the groove. Kimata at col. 5, lines 1-3. Accordingly, Kimata does not teach or suggest "a gate of a transistor formed at least partially below a surface of the substrate . . . a channel region of the transistor located below the bottom surface of the gate," as recited by amended independent claim 1; or "a channel region of the transistor formed below the trench," as recited by amended independent claim 20.

Applicants also submit that one of ordinary skill in the art at the time the invention was made would not have been motivated to modify the teachings of Koizumi with the teachings of Kimata to achieve the invention as claimed in amended independent claims 1 and 20. Even assuming one of ordinary skill in the art would have been motivated to modify the device of Koizumi with Kimata's CSD, further modification of Kimata's CSD would be required to achieve the invention as claimed. Neither reference teaches or suggests such further modification and there is no motivation for such modification. For at least these reasons, withdrawal of this rejection is respectfully requested.

Claims 24-37 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Koizumiin view of Kimata, and in further view of Furumiya et al., US Patent No. 6,639,293 (Furumiya). This rejection is respectfully traversed.

Neither Koizumi nor Kimata, even when considered in combination, teach or suggest all limitations of any of amended independent claim 24. Like amended independent claim 1, amended independent claim 24 recites "a gate of a transistor formed at least partially below a surface of the substrate . . . a channel region of the transistor located below the bottom surface of the gate." As discussed above, Koizumi and Kimata, alone or in combination, fail to teach or suggest these limitations. Additionally, for the reasons discussed above, one of ordinary skill in the art at the time the invention was made would not have been motivated to modify the teachings of Koizumi with the teachings of Kimata to achieve the invention as claims in amended independent claim 24.

Furumiya is cited for teaching an analog signal processor. Office Action at 5. Accordingly, Furumiya does not supplement the deficiencies of Koizumi and Kimata. For at least these reasons, withdrawal of this rejection is respectfully requested.

In view of the above amendment, applicant believes the pending application is in condition for allowance.

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Respectfully submitted,

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